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A Longitudinal Study of the Bidirectional Relationship Between Social Support and Posttraumatic Stress Following a Natural Disaster

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There is ample evidence that social support is protective against posttraumatic stress (PTS) symptoms through social causation processes. It is also likely that PTS is associated with decreased social support through social selection processes. Few studies, however, have examined the longitudinal and bidirectional associations between social support and PTS in a postdisaster context, and whether such associations vary by type of support (e.g., emotional, informational, or tangible). We examined these relationships using Galveston Bay Recovery Study data. Participants ($N = 658$) were interviewed 2–6 months (W1), 5–9 months (W2), and 14–19 months (W3) after Hurricane Ike in 2008. Longitudinal relationships between each support type and PTS were examined in cross-lagged models. W1 emotional support was negatively associated with W2 PTS (Estimate = –.13, $p = .007$), consistent with social causation. W1 PTS was negatively associated with W2 emotional support (Estimate = –.14, $p = .019$), consistent with social selection. In contrast, pathways were nonsignificant at subsequent waves and for informational and tangible support. Results suggested that postdisaster social causation and selection were limited to emotional support and diminish over time. Based on these findings, postdisaster services should emphasize restoring supportive social connections to minimize the psychiatric consequences of disaster, especially among those with prior evidence of distress.

In the aftermath of natural disasters, social support is considered one of the most important protective factors against posttraumatic stress (PTS; Joseph, 1999). Postdisaster social support can take several forms, including emotional support (e.g., empathy, companionship), informational support (e.g., information about available services, or how to address disaster-related stressors), and tangible support (e.g., financial loans, assistance with cooking and cleaning). All three forms of support are thought to play a significant role in shaping the postdisaster experience, helping survivors cope with disaster-related stressors and protecting against adverse mental health outcomes (Kaniasty & Norris, 2009). The majority of research investigating the role of social support in the aftermath of disasters has relied on an adapted model of social causation whereby predisaster levels of social resources, in this case low social support, are shown to increase the risk of mental disorders (Johnson, Cohen, Dohrenwend, Link, & Brook, 1999). Social causation effects have been identified in numerous disaster studies, among them earthquakes (Derivois, Cenat, & Merisier, 2014), floods (Cook & Bickman, 1990), mudslides (Kaniasty & Norris, 2008), and hurricanes (Lowe, Chan, & Rhodes, 2010).

The relationship, however, between social support and PTS in the aftermath of disasters is likely bidirectional. Over time, social support affects the risk and severity of psychiatric conditions and may undermine subsequent levels of social support, through the affected individual's increased tendency for withdrawal, loss of interest in interpersonal activities, and potentially alienating arousal or aggressive behavior (Joseph, 1999). In addition, PTS could contribute to interpretations that support was unavailable, that is, perceptions of low support are decreased among individuals with elevated PTS. This latter pathway may be due to social selection, whereby individuals with increased psychiatric pathology are selected out of supportive social relationships, or perceive them to be less available (Dohrenwend, 2000). Overall, this bidirectional

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relationship may lead to chronic PTS reinforced by deterioration of social support, prolonging symptoms for years after a traumatic event (Davidson, Hughes, Blazer, & George, 1991).

Few studies have tested the social selection model in a postdisaster context. One was a 6-year prospective study of social support trajectories among low-income women who experienced Hurricane Katrina. Lowe and Willis (2015) found that psychological distress was subsequently associated with lower perceived support over the 6-year period. To our knowledge, only one published study has explored simultaneous social causation and social selection processes among victims of a natural disaster over time (Kaniasty & Norris, 2008). In this study, the authors identified causation and selection mechanisms between perceived family support and PTS in two communities severely affected by flooding and mudslides in Mexico. The findings represent empirical support for a distinction between causation and selection processes in a postdisaster context.

The literature on social support and PTS is further limited in at least three ways. First, although several studies have utilized longitudinal designs, the lag between baseline and follow-up interviews was often 1 or more years, during which important changes in social support and PTS may have been missed (Neria, Nandi, & Galea, 2008). Second, most studies included only one follow-up interview, though two waves of data are arguably insufficient to obtain significant information about how complex processes change over time (Kenny, 2005). Third, few studies have assessed support and PTS concurrently and in successive follow-up periods, which would enable researchers to understand whether and to what degree the two constructs interact and operate over time. Although Kaniasty and Norris (2008) addressed many of these limitations, additional research to apply their methodology to a different cultural context would expand the knowledge of social causation and social selection processes in the aftermath of disasters. Also, in their study, social support was typically measured as a single construct, whereas three psychometrically distinct types are often reported in the postdisaster response: tangible, information, and emotional support (Kaniasty & Norris, 1995). Different types of support may be salient during different times and contexts of disaster response (Kaniasty & Norris, 1992). As such, measuring several types of support may illuminate potentially distinct components and improve an understanding of the importance of each during different postdisaster periods.

The present study examined bidirectional and longitudinal relationships between three types of received social support and PTS in a population-based sample of adults who directly experienced a large-scale natural disaster, Hurricane Ike. At three postdisaster time points, participants reported PTS, and emotional, informational, and tangible support. Using cross-lagged modeling, we examined relationships between each form of support and PTS to further our understanding of the role social causation or social selection mechanisms over time in the aftermath of disaster.

Method

Participants and Procedure

Making landfall in September 2008, Hurricane Ike severely affected residents of Galveston and Chambers counties, as well as outlying areas along the gulf coast of Texas. Over 200,000 people were affected, including 12 who died, and 34 who remained missing for over 5 months. The cost of the storm totaled over $12 billion (Coley, 2008). Detailed investigations of the health and economic impact of the hurricane have been previously published (e.g., Norris, Sherrieb, & Galea, 2010; Pan, 2014).

Data came from the Galveston Bay Recovery Study (GBRS). Eligible participants for GBRS were at least 18 years old and had lived in either Galveston or Chambers County for at least 1 month prior to the hurricane. A disproportionate stratified cluster design was used to oversample non-Hispanic Black residents and households most directly exposed to disaster-related events. Initially, 1,285 households were identified and 935 provided oral consent for a preliminary screening. Within households, 861 individuals were eligible for inclusion. The final Wave 1 (W1) cohort included 658 individuals (76.4% of the eligible sample). Interviews were performed using a computer-assisted interview system, of which 88% were conducted via telephone and 12% were conducted in person. This approach to obtaining informed consent, as well as all study procedures, was approved by the institutional review boards of the University of Michigan, Dartmouth College, and Yale University. Full study design details have been previously described (Norris et al., 2010). W1 interviews were conducted between 2–6 months postdisaster. Of the W1 sample, 529 participants (80.4%) were reinterviewed at 5–9 months (W2) and 487 (74.0%) were reinterviewed 14–19 months (W3) postdisaster. Overall, 448 (68.1%) participants completed all three interviews. The majority of the sample comprised individuals who were female (51.5%), non-Hispanic White (63.6%), and married (55.0%).

Measures

The PTSD Checklist-Specific version (PCL-S; Weathers, Litz, Herman, Huska, & Keane, 1993) was used to collect post-traumatic reactions in response to Hurricane Ike, according to symptom criteria from the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., *DSM-IV*; American Psychiatric Association, 1994) PTSD module. The 17-item scale assesses four underlying symptom clusters, including 5 reexperiencing, 3 avoidance, 4 numbing, and 5 arousal symptoms. During the W1 interview, participants were asked to refer to the period since Hurricane Ike (i.e., 2–6 months), while at W2 and W3, they reported on symptoms since the last interview. The PCL-S has demonstrated excellent agreement with clinical PTSD diagnosis and symptom ratings (Ruggiero, Ben, Scotti, & Rabalais, 2003). The internal consistency in this study was $\alpha = .92$ at W1, $\alpha = .93$ at W2, and $\alpha = .94$ at W3.

The Inventory of Postdisaster Social Support measured received social support experienced between the hurricane and W1, or between waves during follow-up interviews (Kaniasty & Norris, 2000). The 11-item scale captured frequencies of three types of support: emotional (ESS; three items, e.g., "family or friends expressed interest or concern for well-being"), informational (ISS; three items, e.g., "family or friends gave advice or suggestions"), and tangible support (TSS; five items, e.g., "family or friends offered money or a place to stay"). Responses ranged from 1 = *never* to 4 = *many times* and were added together to create a summary score for each type of support. The internal consistency in this study was $\alpha = .85$ at W1, $\alpha = .84$ at W2, and $\alpha = .86$ at W3.

Two indicators of hurricane exposure during and after Hurricane Ike were assessed at W1 with a series of dichotomous items used previously in studies of other natural disasters (David et al., 1996; Galea et al., 2007): the reported number of hurricane-related traumatic events (e.g., physical injury as a result of the hurricane, family member or close friend killed or injured, saw dead bodies during or after the hurricane, other traumatic event; range 0 – 4), and the reported number of hurricane-related stressors (e.g., being displaced from home, being without resources for over 1 week, any personal property loss, loss of sentimental possessions, self or household member developed health problems, financial loss, increased demands or relationship problems; range 0 – 7).

We also included six demographic variables that have been previously associated with social support and psychological distress (Norris, Baker, Murphy, & Kaniasty, 2005). Sex, race/ethnicity, and marital and parenthood status were included as exogenous categorical variables, and age, previous year income level (less than $10,000; $10,000–$19,999; $20,000–$39,999; $40,000–$59,999; $60,000–$79,999; $80,000–$99,999; $100,000 or more), and education level (less than high school; high school degree or equivalent; some college; college degree; graduate work) were modeled as continuous variables. All demographic characteristics were self-reported and assessed at W1.

Finally, we included a dichotomous variable indicator whether participants had symptoms consistent with a probable diagnosis of lifetime PTSD prior to the hurricane. A diagnosis of probable PTSD was based on the lifetime endorsement of at least one intrusion symptom, three avoidance/numbing symptoms, and two arousal symptoms in combination with distress or dysfunction and duration of at least 1 month (Norris et al., 2010). All symptoms were measured on a 5-point scale: 1 = *not at all*, 2 = *a little bit*, 3 = *moderately*, 4 = *quite a bit*, and 5 = *extremely*. Items were dichotomized into two groups: No endorsement included response levels 1–2, and positive endorsement included response levels 3–5.

Data Analysis

Data analysis was conducted in Mplus 7.0 (Muthén & Muthén, 2013). Multiple imputation in IVEWARE software (Raghunathan, Solenberger, & Van Hoewyk, 2002) was used to handle within-wave missing data. Data were imputed based on variables collected prior to or at the same time as the variable with missing data. Maximum likelihood (ML) estimation with robust standard errors, via the MLR estimator in Mplus, was used to handle between-wave missing data, as well as nonnormality. Bonferroni-corrected analyses of variance and χ^2 tests were conducted to assess for differences between complete and incomplete cases.

The average proportion of within-wave missing data in the study was 1.4% ($SD = 3.4\%$, range 0.0% to 11.4%). For the study variables, 515 (78.3%) W1 participants had complete W1 data, 527 (99.6%) W2 participants had complete W2 data, and 479 (98.4%) of W3 participants had complete W3 data. No significant differences were detected between complete and incomplete cases within each wave. In addition, there were no significant differences in study variable frequencies between the 448 participants who completed all three waves and the 210 participants who missed their follow-up interviews. Therefore, we proceeded using the entire study sample in our analysis ($N = 658$).

All subsequent analyses were weighted to account for differential sampling probabilities among sampling strata, probabilities of selection within households, nonresponse, attrition, and to account for sociodemographic differences between the sample and the population in Galveston and Chambers counties according to the 2005-2007 American Community Survey (ICPSR Data Holdings, 2010).

Three steps were taken to fulfill our study aims. First, univariate descriptive statistics and correlations for all variables in the study were computed. Second, longitudinal measurement models were run for PTS and each social support type. Mean scores for items assessing reexperiencing, avoidance, numbing, and hyperarousal subscales were entered as indicators of PTS based on prior research suggesting this 4-factor structure (King, Leskin, King, & Weathers, 1998). Each form of social support was modeled with three indicators. Indicators of ESS and ISS were the three items from each subscale, and parceling was used for TSS to fit the five subscale items to three indicators. All measurement models included correlated errors between each indicator at each wave. Baseline models allowed for free estimations of factor loadings and intercepts, and variances of the latent variable at each wave was constrained to 1.0. Subsequent models tested for weak factorial invariance by assessing whether factor loadings were time invariant by constraining them to equality across the waves, and setting the variance of only the W1 latent variable to 1.0 (Ferrer & McArdle, 2003). Third, cross-lagged models for latent constructs of PTS and each form of social support were conducted. Initial models included paths from all demographic covariates to all latent variables, and trimmed models eliminated any of these paths that were nonsignificant (defined as $p > .10$) in line with similar previous research (e.g., DuBois, Burk–Braxton, Swenson, Tevendale, & Hardesty, 2002; Erath, Flanagan, & Bierman, 2007).

Goodness of fit in measurement and cross-lagged models was evaluated using the root mean square error of approximation (RMSEA) and its 90% confidence interval (CI), and the comparative fit index (CFI). Based on previous recommendations (Hu & Bentler, 1999; Little, 2009; Wall & Amemiya, 2000), we set cutoffs for acceptable fit at RMSEA $< .10$ and CFI $> .90$, and cutoffs for good fit at RMSEA $< .05$ and CFI $> .95$. Because of the use of multiple imputation, χ^2 difference tests were not available to compare the fit of nested models. The comparative fit of nested measurement models was evaluated using change in CFI, with changes $\geq .01$ indicating worse fit (Cheung & Rensvold, 2002). The comparative fit of nested cross-lagged models was evaluated using Wald χ^2 tests of parameter constraints (Molenberghs & Verbeke, 2007).

Results

Overall, PTS decreased between W1 and W2, and increased between W2 and W3. The same pattern was observed for ISS and TSS. In contrast, ESS increased between W1 and W2, and decreased between W2 and W3. Per-item averages show that ESS was the most common type of support across all waves (ESS = 3.06, *SD* = 0.93; ISS = 2.34, *SD* = 0.90; TSS = 2.02, *SD* = 1.27). Respondents reported a mean of 3.05 hurricane stressors (*SD* = 1.67), and 0.15 traumatic events (*SD* = 0.50). The prevalence of probable PTSD was 8.3% at W1, 2.6% at W2, and 2.8% at W3 (data not shown). Table 1 shows the univariate distribution and correlations of all sample variables for all study waves.

Fit statistics for all measurement models were calculated for respective baseline and time invariant models. PTS: RMSEA = .04, CFI = .98 and RMSEA = .03, CFI = .99; ESS: RMSEA = .04, CFI = .98 and RMSEA = .02, CFI = .99; ISS: RMSEA = .92, CFI = .06 and RMSEA = .03, CFI = .98; TSS: RMSEA = .91, CFI = .05 and RMSEA = .02, CFI = .99. Each of the measurement models evidenced adequate or good fit with the data, and in no case was there a decrease in CFI $\geq .01$. Therefore, we concluded that the factor loadings in each of the measurement models were time invariant.

Cross-lagged models and fit indices are shown in Figure 1a. Each model evidenced adequate or good fit with the data. In the ESS model, the cross-lagged paths from W1 ESS to W2 PTS, and W1 PTS to W2 ESS were statistically significant. Higher W1 ESS was associated with lower W2 PTS (Estimate = −.13, 95% CI [−.22, −.04], $p = .007$), and higher W1 PTS was associated with lower W2 ESS (Estimate = −.14, 95% CI [−.25, −.02], $p = .019$). All other cross-lagged paths were nonsignificant. In supplementary analyses, we ran nested models with cross-lagged paths excluded. None significantly led to a decline in model fit, with the following exceptions: the model without both paths from ESS to PTS (Wald = 6.66, $df = 2$, $p = .036$), the model without both cross-lagged paths from W1 to W2 (Wald = 8.26, $df = 2$, $p = .016$), the model without the path from W1 ESS to W2 PTS (Wald = 6.51, $df = 1$, $p = .011$), and the model without the path from W1 PTS and W2 ESS (Wald = 5.31, $df = 1$, $p = .021$).

Discussion

This study examined the longitudinal and bidirectional relationships between three types of social support (emotional, informational, and tangible) and PTS in a representative sample of adults who experienced a large-scale natural disaster. The results provided evidence for both causation and selection mechanisms. First, lower W1 emotional support was associated with a higher W2 PTS: Persons who received less emotional support in the early aftermath of the disaster tended to have higher subsequent PTS, consistent with social causation processes. Second, higher W1 PTS was significantly associated with lower W2 emotional support: Individuals with higher PTS in the early postdisaster period were more likely to subsequently report lower levels of emotional support, consistent with social selection processes. Taken together, the results suggested that both social causation and social selection processes operated postdisaster, but were limited to emotional support and did not persist over time. The results are consistent with previous studies that identified both processes postdisaster (Kaniasty & Norris, 2008), and provided additional insight into the types of social support that may and may not be most critical to reduce the risk of psychiatric illness among disaster survivors.

There are several possible explanations for why the social causation and selection processes we identified were limited to emotional support. After a large-scale disaster, it is common for all types of social support to be significantly reduced, although emotional support is often least susceptible to reduced availability (Kaniasty & Norris, 2000). Indeed, it was the most common type of support reported in the present study. Emotional support may be instrumental in the reappraisal process in coping, during which the victim considers alternative outcomes of their traumatic experience. Reappraisal is highly sensitive to the opinions of one's social contacts (Williams & Joseph, 1999); delivered as a form of emotional support, it may also buffer the risk for PTS. Further, emotional support may be reinforced by psychological stress that is often a part of the normative community response to trauma, through feelings of empathy, altruism, and solidarity (Norris & Kaniasty, 1996). These characteristics are thought to buffer the acute disruption from a disaster, and may be the only resources that individuals can expect from each other as they work to restore a sense of order and emotional equilibrium and reduce the risk for increased PTS over time.

Tangible support, in the form of money and food, for example, generally requires a higher cost for the support provider compared to other types of support, and may therefore be less available postdisaster. It was the least common type of support reported in the GBRS. As such, it may have been reserved for individuals who are most significantly impaired by a disaster, potentially through a separate health condition

Table 1
Descriptive Statistics and Zero-Order Correlations Among Variables

Variable	*n* or *M*	% or *SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1. W1 ESS	9.23	2.65	–																						
2. W2 ESS	9.33	2.58	.54	–																					
3. W3 ESS	9.00	2.78	.53	.56	–																				
4. W1 ISS	7.10	2.64	.47	.26	.22	–																			
5. W2 ISS	6.67	2.60	.36	.57	.38	.49	–																		
6. W3 ISS	7.11	2.65	.32	.37	.64	.29	.45	–																	
7. W1 TSS	10.96	3.77	.59	.32	.35	.56	.38	.37	–																
8. W2 TSS	9.20	3.47	.36	.46	.29	.35	.57	.35	.49	–															
9. W3 TSS	10.09	3.79	.36	.34	.58	.28	.41	.70	.49	.46	–														
10. W1 PTS	26.45	12.86	−.04	−.11	−.08	.25	.11	.04	.04	.00	−.02	–													
11. W2 PTS	22.81	9.53	−.14	−.22	−.16	.16	.03	.05	−.06	−.06	−.04	.78	–												
12. W3 PTS	24.10	1.73	−.22	−.24	−.18	.16	.02	.06	−.07	−.03	−.01	.60	.75	–											
13. NH Black	96	13.6	−.09	−.03	−.02	.10	.04	.01	−.07	.04	.06	.22	.21	.33	–										
14. Hispanic	121	18.5	−.12	−.07	−.23	.00	.04	−.18	.01	.10	−.11	.10	.09	.06	−.19	–									
15. Other race	33	4.3	−.09	−.06	−.09	−.13	−.11	−.08	−.08	−.08	−.10	.01	−.01	−.02	−.08	−.10	–								
16. Single	89	27.3	−.07	.08	.13	.09	.20	.18	.06	.23	.17	.02	.01	.09	.27	.06	.12	–							
17. Div., Sep., Wid.	135	17.7	−.11	−.07	−.06	−.05	−.06	−.06	−.08	−.06	−.04	.12	.12	.13	.10	.00	.03	−.28	–						
18. Ike stressors	3.05	1.67	.02	−.08	−.02	.21	.05	.14	.20	.03	.07	.47	.45	.41	.12	−.02	−.05	.17	−.04	–					
19. Ike trauma	0.15	0.50	−.18	−.17	−.12	.11	−.09	−.01	−.09	−.12	−.13	.36	.36	.45	.30	−.05	−.01	.16	.06	.29	–				
20. Age (years)	45.63	17.24	−.01	−.12	−.13	−.17	−.23	−.11	−.15	−.21	−.10	.00	.12	0.19	.00	−.22	.04	−.45	.25	−.07	−.06	–			
21. Male	264	48.5	−.22	−.18	−.11	−.19	−.10	.10	−.02	−.01	.10	−.10	−.05	.03	−.09	.02	.08	.12	−.18	.15	.07	.01	–		
22. Children in home	189	34.8	−.05	.03	−.04	.06	.04	−.04	−.06	.01	−.06	−.02	−.05	−.10	−.02	.09	−.05	−.10	−.03	−.04	.04	−.41	−.20	–	
23. Probable PTSD	69	10.3	−.03	.00	.04	.04	.04	.04	−.11	−.05	.00	.22	.23	.12	−.05	−.08	−.04	−.09	.09	.09	.01	.08	−.10	.08	–
24. Income	4.42	1.97	.13	.06	.06	−.03	.02	.09	.04	−.10	−.06	−.23	−.25	−.33	−.30	−.22	−.03	−.18	−.22	.15	−.18	−.07	.12	.03	−.06

Note. $N = 658$. W1 = Wave 1: 2–6 months postdisaster; W2 = Wave 2: 5–9 months postdisaster; W3 = Wave 3: 14–19 months postdisaster; ESS = emotional social support; ISS = informational social support; TSS = tangible social support; PTS = posttraumatic stress; NH = Non-Hispanic; Div., Sep., Wid. = Divorced, Separated, Widowed; PTSD = posttraumatic stress disorder.
$|r| = .08–.10, p < .05$. $|r| = .11–.12, p < .01$. $|r| \geq .13, p < .001$.

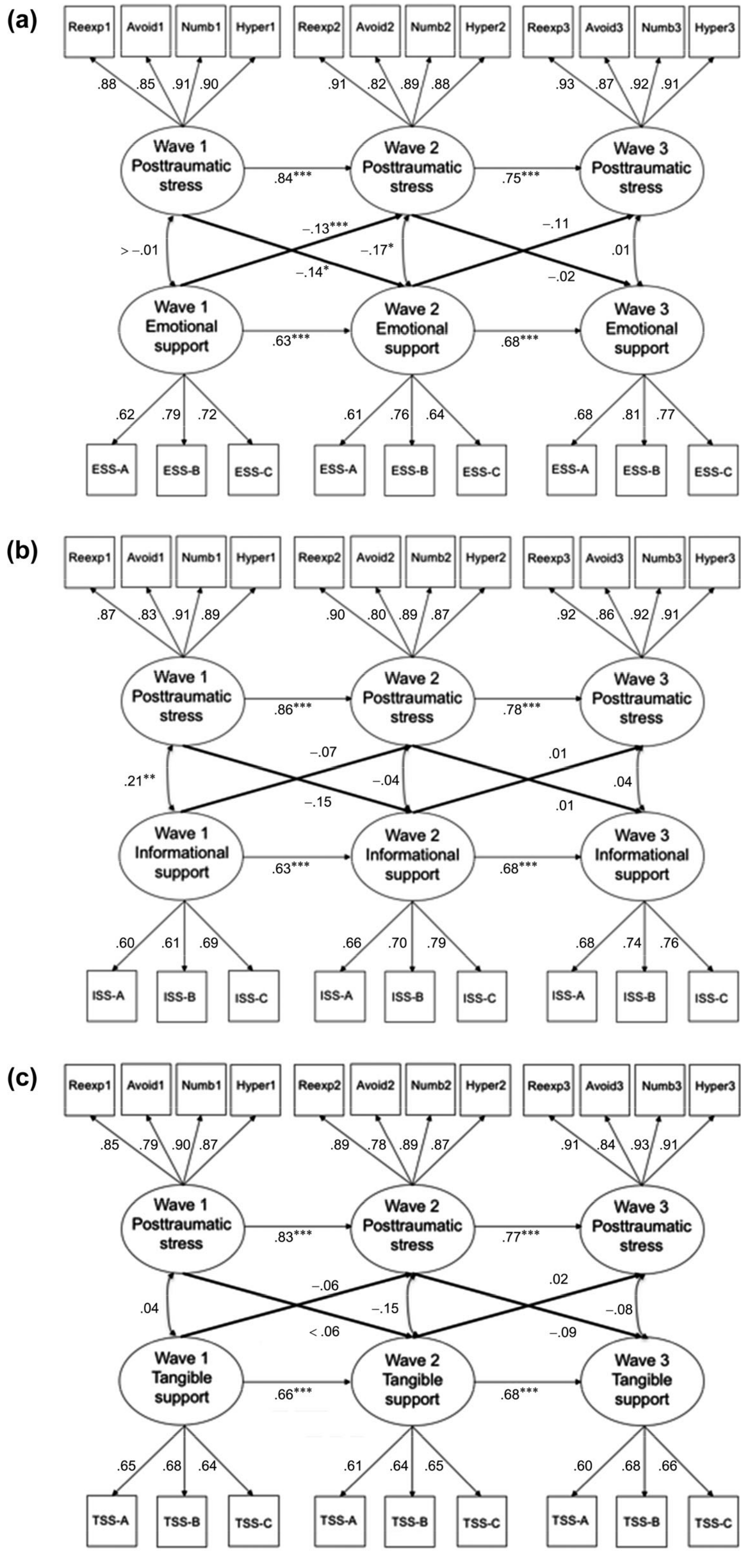

Figure 1. N = 658. (**A**) Cross-lagged models and standardized coefficients of bidirectional relations between posttraumatic stress (PTS) and emotional social support. (**B**) Cross-lagged models and standardized coefficients of bidirectional relations between posttraumatic stress (PTS) and informational social support. (**C**) Cross-lagged models and standardized coefficients of bidirectional relations between posttraumatic stress (PTS) and tangible social support. Wave 1 = 2–6 months postdisaster; Wave 2 = 5–9 months postdisaster; Wave 3 = 14–19 months postdisaster; Reexp = reexperiencing symptoms; Avoid = avoidance symptoms; Numb = numbing symptoms; Hyper = hyperarousal symptoms at each wave; ESS-A, B, C = emotional social support items; ISS-A, B, C = informational social support items; TSS-A, B, C = tangible social support items.
$^*p < .05$. $^{**}p < .01$. $^{***}p < .001$.

associated with both the utilization of support and the risk of PTS. We controlled for the severity of hurricane exposure and predisaster threshold PTSD to minimize this possibility.

In interpreting the results for informational support, we noted that the covariance between informational support and PTS at W1 was significant and positive (Est = .21, 95% CI [.07, .35], $p = .004$), meaning that respondents with greater received informational support also reported greater concurrent PTS. This suggests that the receipt of informational support may provide immediate relief from PTS, but not protect against longer-term symptoms, thus resulting in nonsignificant causation and selection pathways. Alternatively, it is possible that PTS was not associated with informational and tangible support because some participants in the study did not have needs for such forms of assistance. Had we limited our sample to participants who reported needs for information and tangible assistance, it is possible that the information and tangible support paths would have reached statistical significance.

As in the current study, Kaniasty and Norris (2008) previously identified both social causation and selection pathways in the aftermath of disaster. Our results, however, differed in the timing and duration of each pathway. This divergence is potentially due to differences in study populations and measures of social support. First, the prevalence of baseline probable PTSD was 3 times higher in their study (24% vs. 8.3% in the current study) and as such, one would expect a greater time to PTS recovery. This could partially explain why the social selection pathway from PTS to social support was significant up to 24 months postdisaster in their study, whereas ours identified no selection pathways after 5–9 months postdisaster. In addition, the two studies employed different measures of social support in different cultural contexts. Kaniasty and Norris (2008) measured support using an 8-item scale of perceived emotional support from family; our study measured received emotional, informational, and tangible support from any member of the respondent's social network. The greatest level of expected support would likely be for emotional support from a respondent's family, which could explain why social support was significantly associated with a decrease in PTS up to 18 months postdisaster in their study. It is also likely that measuring perceived support may capture significantly different aspects of the association between support and PTS, and thus yield different results between studies.

These results should be interpreted in light of several limitations. First, it was possible that individuals who were most adversely affected by the hurricane were not included in the sample for study-related reasons. For example, those dealing with severe hurricane-related stressors may have been more likely to decline participation, potentially resulting in unmeasured selection processes that could have attenuated our model estimates toward nonsignificance. Therefore, our results should be considered conservative population estimates. Similarly, though the majority (68.1%) of the study sample reported evacuating their homes prior to the storm, some did not evacuate. The decision or ability to evacuate may have increased with greater social support, potentially in the form of reinforcement of evacuation information, transportation, or a place to stay (Kaniasty & Norris, 1995). These processes could have resulted in the selection pressure of those with lower social support into the baseline GBRS sample. Future studies should also investigate the explanations for and mental health impacts of nonevacuation, which increased the risk of hurricane-related injury in the study sample (Norris et al., 2010). Second, although we examined the influence of the number of hurricane-related stressors and traumatic events on W1 PTS and support, we did not explore whether the strength of the cross-lagged pathways was moderated by the severity of hurricane exposure. For example, social causation and social selection processes may be more significant among persons who have experienced particularly high levels of exposure. Also, previous research suggested social support to be a particularly important protective factor for women in the aftermath of disasters; as such, the relationships between PTS and social support might be stronger for women than for men (Lowe & Willis, 2015). Further research that explores this issue would prove a useful step forward in understanding the relationship between social support and PTS. Additionally, an investigation of the associations between specific PTS symptom clusters (e.g., avoidance, hyperarousal) and social support might yield more insight into specific mechanisms or behaviors that lead to social selection, and might inform targeted symptom therapies. Finally, previous work has shown emotional support to be the most common type of support exchanged in a postdisaster recovery period (Joseph, 1999), but it may also be the least-specific type of support and thus less specifically associated with one particular traumatic event (Kaniasty & Norris, 2009). Although it is possible that this may result in a spurious association due to the background effect of general emotional support, framing each social support item in the context of a postdisaster experience likely minimized this risk.

Despite these limitations, this study contributed to a greater understanding of both the risk factors for and consequences of PTS. The results provided further support for the simultaneous exploration of social selection and causation processes in future postdisaster studies. Our results were consistent with recommendations for mental health service providers in the aftermath of a disaster that include "participating in a support group" and "talking to another person for support" (e.g., Brymer et al., 2006), to restore supportive social connections and minimize the psychiatric consequences of disaster through social causation processes. For social selection processes, priority should be placed on targeting individuals with evidence of distress for the restoration of normal social functioning and the improvement of psychiatric health.

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